Prepared for the
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT COOPERATIVE STUDY

GEOLOGIC CHARACTERIZATION OF LAKE DIAS

VOLUSIA COUNTY, FLORIDA

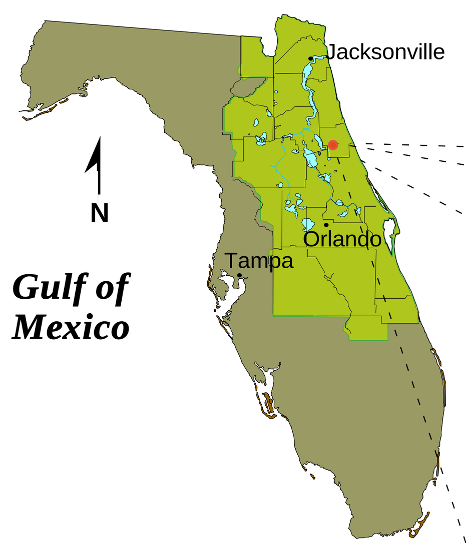
By

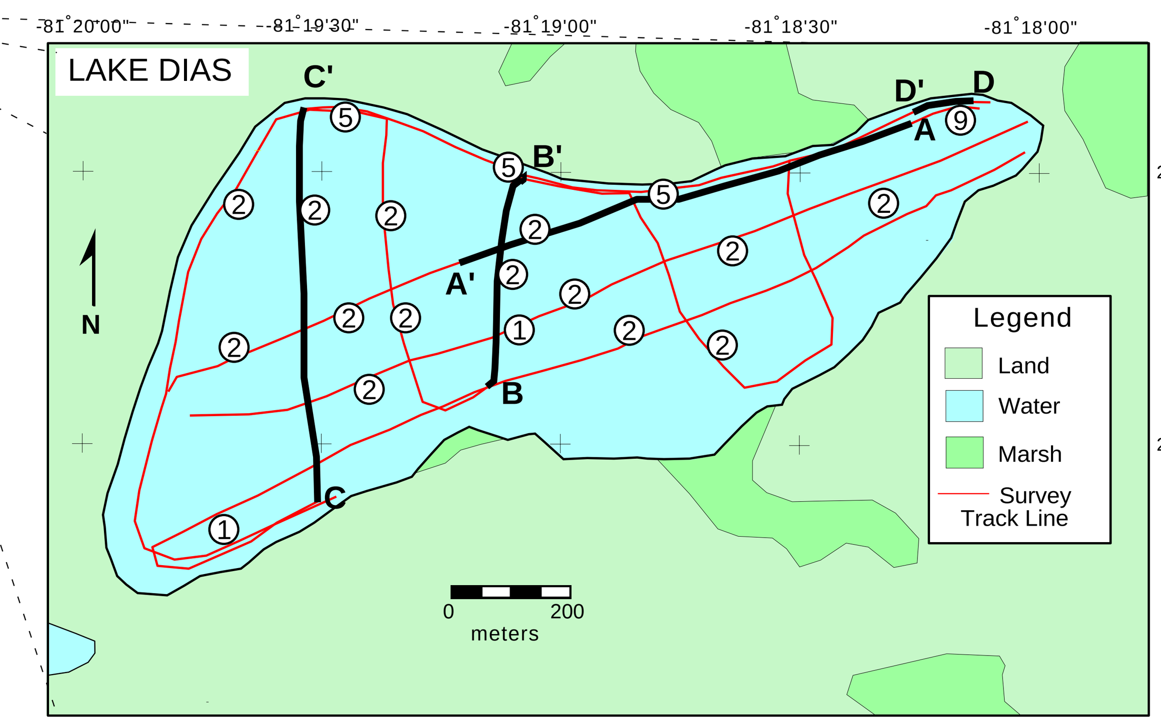
Jack L. Kindinger[1], Jeffrey B. Davis[2], and James G. Flocks[1]

1997

[1] Center fo Coastal Geology and Regional Marine Studies
U.S. Geological Survey
St. Petersburg, FL

[2] St. Johns River Water Management District
Palatka, FL





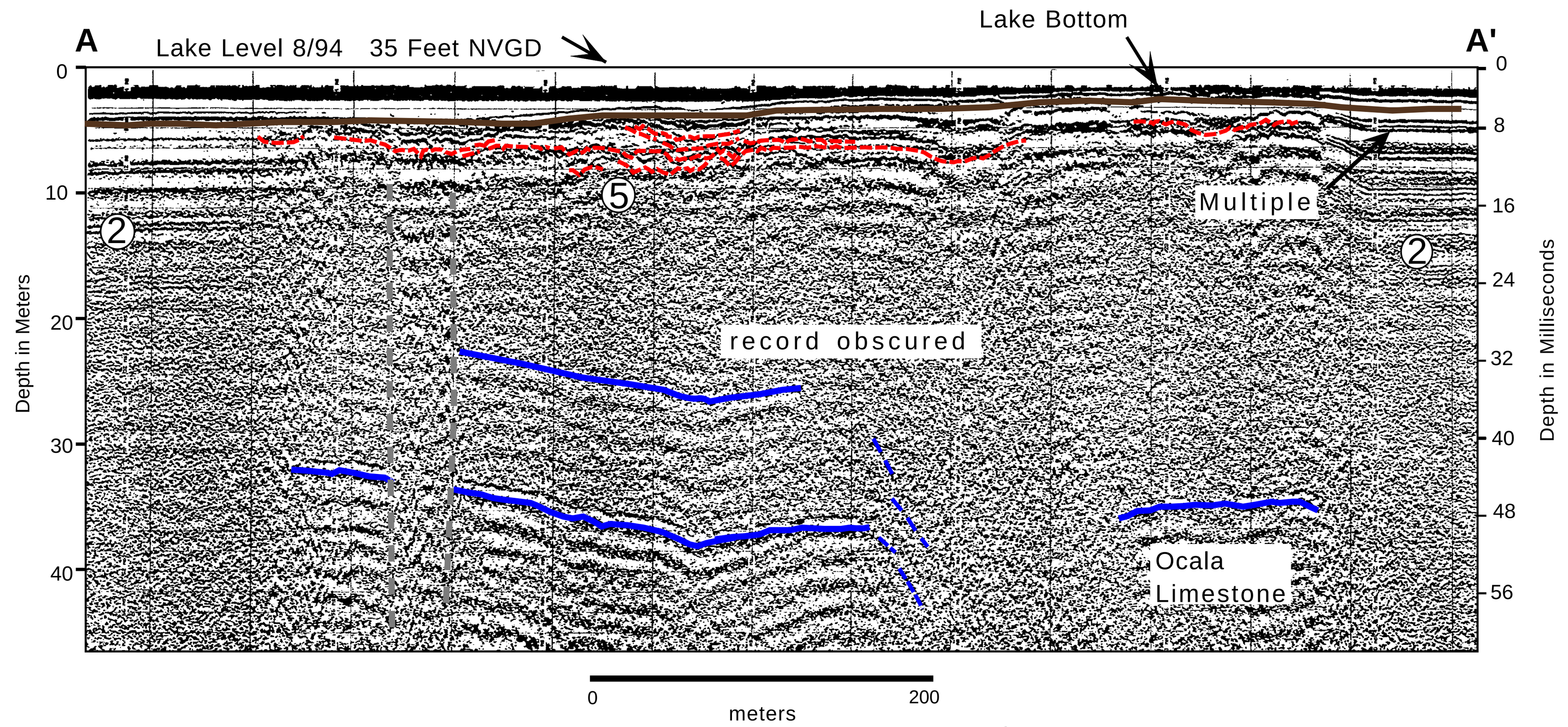
PHYSIOGRAPHY

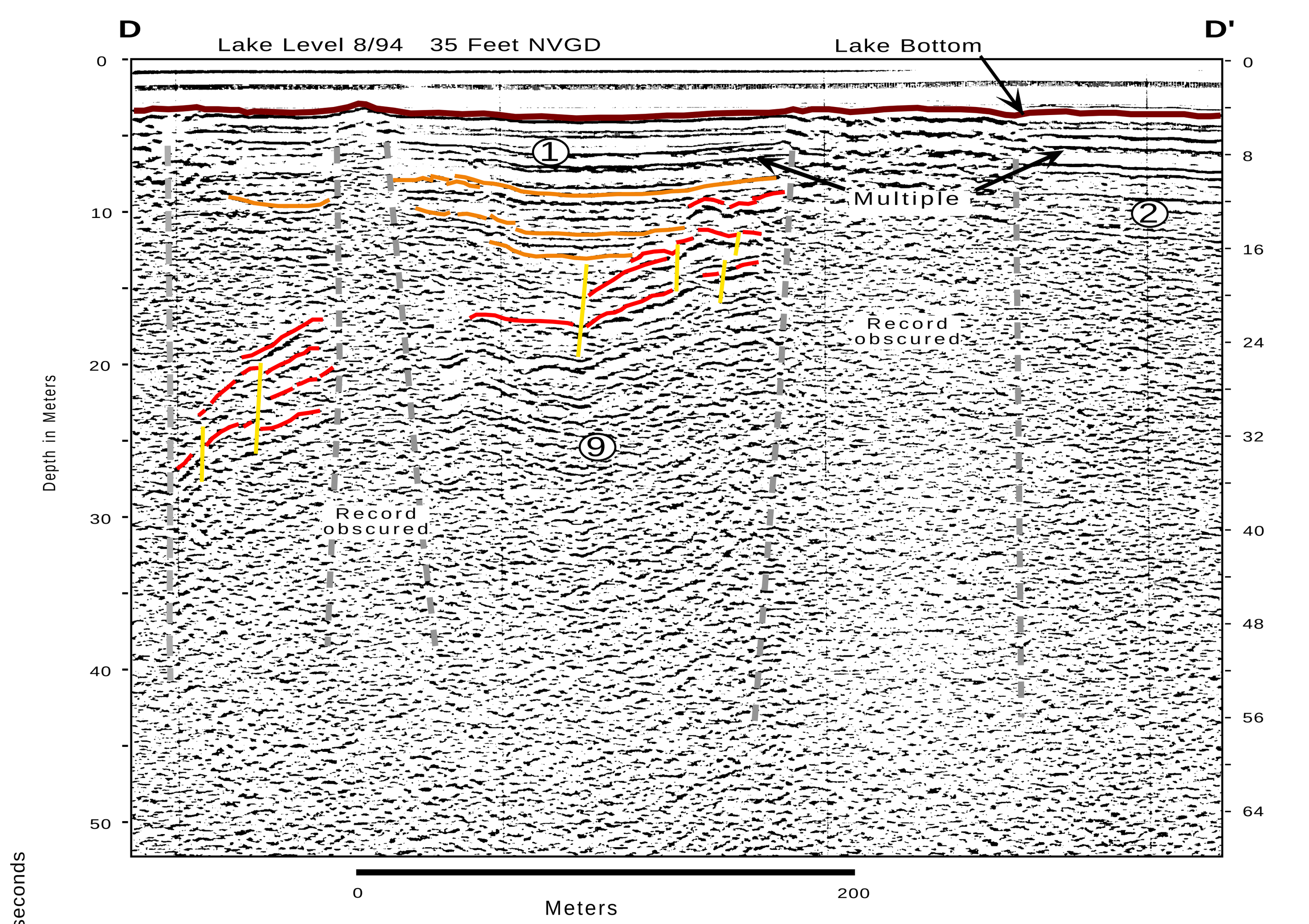
Lake Dias is located in north-central Volusia County. The lake lies on the northern part of the Deland Ridge, near the eastern edge of the Central Lakes District which is the principle recharge area for the Floridan aquifer. The ridge straddles the swampy lowlands of Lake Woodruff to the west and Little Haw Creek to the east. The Cresent City-Deland ridge physiographic subdivision consists of sand hills with summits generally between 24 and 30 meters in elevation. Plio-Pliestocene sand and shell rest directly upon the Floridan Aquifer. The lake level at the time (August, 1994) of the seismic survey was 10.6 m (35 ft) NVGD. Lake Dias is oval in shape, with a perimeter of 8.7 km, an area of 4.3 sq km, and average water depth of approximately 3m (6 ft).

GEOLOGIC CHARACTERIZATION

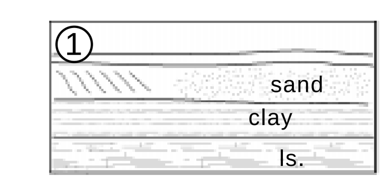
Seismic profiles from Lake Dias are predominantly obscured at depth. A strong bottom reflector leads to multiples seen throughout the data that obscure some of the record in the deeper portions of the lake (profile C-C'). The record is also partially obscured in areas where the lake bottom nears the surface (profile A-A', B-B'). In general the lake is characterized as a single large depression comprising most of the lake (figure 1, blue line). Deep reflectors tend to drop prior to becoming obscured near the central portions of the lake (profile B-B', blue lines), suggests that deep structures influence the lake bathymetry. Faint, nearsurface reflectors in some of the profiles near the fringes of the lake have a hummocky appearance (index map, type 5 feature, profiles, A-A', B-B', red lines). The reflectors may represent smaller subsidence features in the fill overlying the deeper subsidence. Profile C-C' also shows some low angle, offlap type reflectors (type 1 feature, red lines) that may represent subsequent fill during subsidence of the lake. Interpretations of Gamma profiles from wells surrounding the lake (profile C-C', hillshade #) show the top of the Ocala Limestone to be between -30 and -50 feet (-9 and -15 meters) NVGD. This would correspond to between 26 and 35 milliseconds depth in the profiles, using an averaged sound velocity of 1500 m/s. This depth would suggest that the blue lines seen in the profiles represent the top of the Ocala Limestone. Dissolution in the Ocala Limestone at depth would drive subsidence in the overlying material and fill.

Profile C-C' shows a feature seen in the extreme northeastern portion of the lake. Pronounced high angle reflectors (red lines), overlain by fill-type horizontal reflectors (orange lines) may represent a collapse structure (type 9 feature). A chaotic signal below the horizontal reflectors could be block fill associated with the intial collapse, which was subsequently overlain by fluvial fill. This is the only area throughout the lake where this type feature is present and could represent a major breach in the confining material overlying the aquifer.



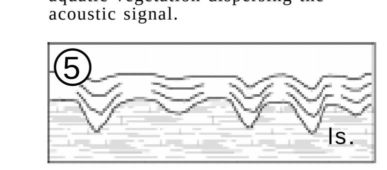


EXPLANATION

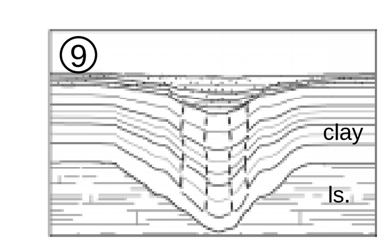


Undisturbed section, with or without upper non-reflective sand layer. Sand layer may show reflection where cross bedding from original deposition (fluvial or aeolian) exits. Clay layers are mostly intact.

Undisturbed section with areas obscured by noise created by muck or aquatic vegetation dispersing the acoustic signal.



Numerous small features with high angle reflectors dipping toward their center. These features may represent localized collapse sinks or filled solution pipes.



Low- to mid-angle subsidence depressions. Parallel reflectors have undergone displacement and rotation, creating stress fractures and faulting within the depression. The subsidence may or may not be filled with overburden.

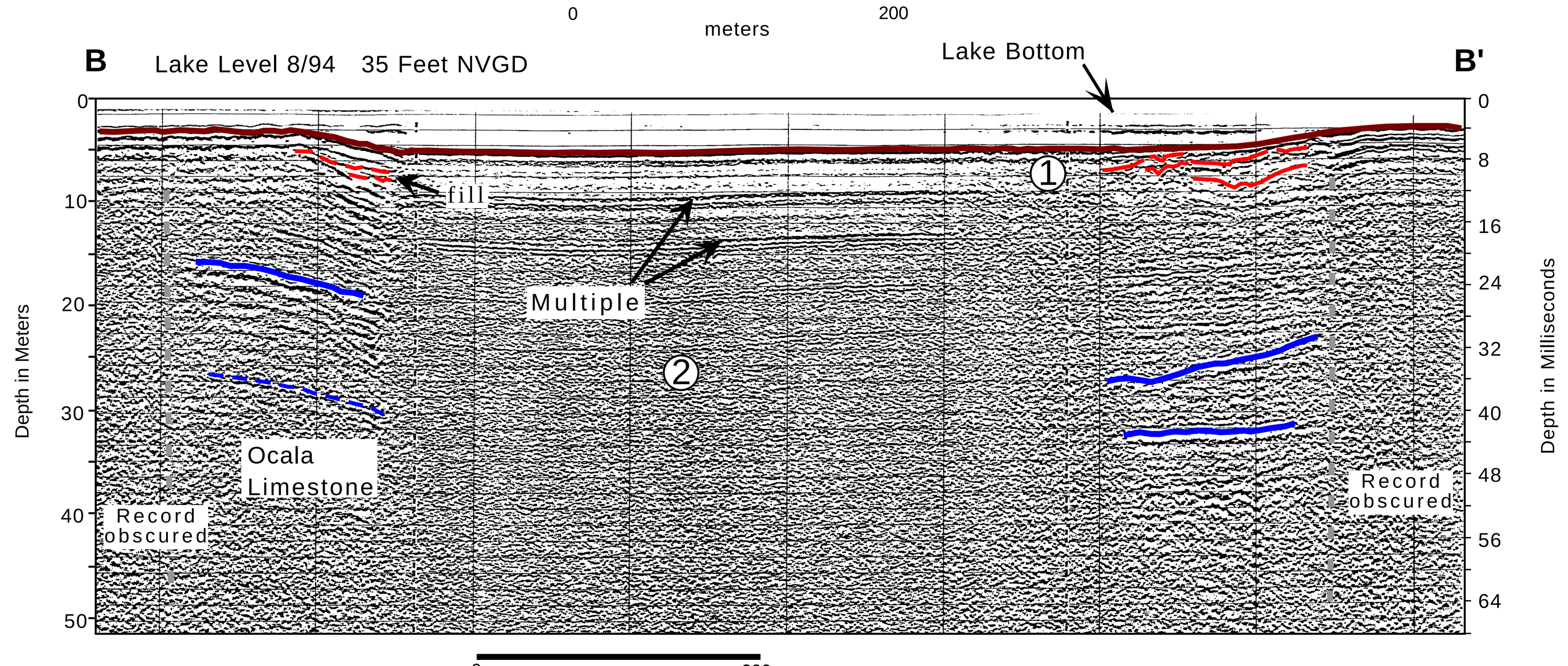
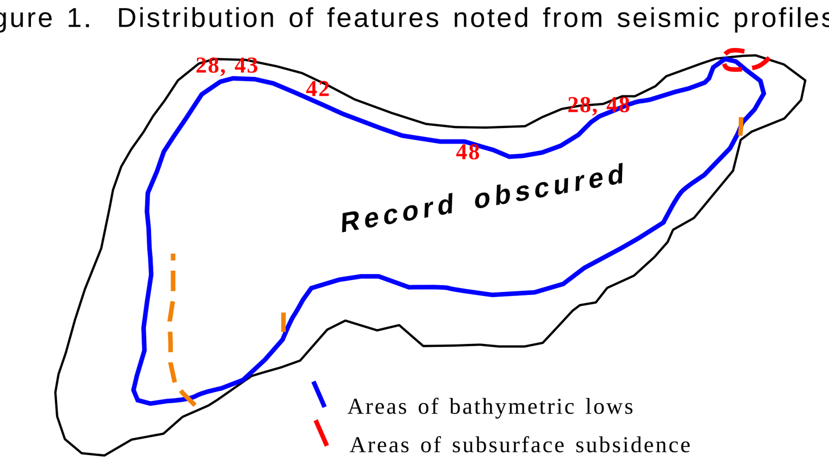


Figure 1. Distribution of features noted from seismic profiles.



Areas of bathymetric lows
Areas of subsurface subsidence
42 Depth to strong reflector (blue lines on profiles)
Scarp (fault?)